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About This Issue

This issue of SIGNews focuses on voice-over-Internet protocol (VoIP) and related telecom and Internet infrastructure technology.

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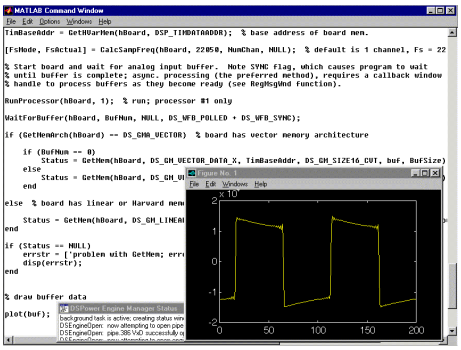
DirectDSP ä Software Speeds MATLABÒ Simulations

When a MATLAB simulation involves DSP boards, the DirectDSP software can reduce the simulation time by hours.


MATLAB Command Window
TimBaseAddr = GetHVarMem(hBoard, DSP_TIMDATAADDR); % base address of board mem.
[FsMode, FsActual] = CalcSampFreq(hBoard, 22050, NumChan, NULL); % default is 1 channel, Fs = 22
% Start board and wait for analog input buffer. Note SYNC flag, which causes program to wait
% until buffer is complete; async. processing (the preferred method), requires a callback window
% handle to process buffers as they become ready (see RegMsgWnd function).
RunProcessor(hBoard, 1); % run; processor #1 only
WaitForBuffer(hBoard, BufNum, NULL, DS_WFB_POLLED + DS_WFB_SYNC);
if (GetMemArch(hBoard) == DS_GMA_VECTOR) % board has vector memory architecture
if (BufNum == 0)
Status = GetMem(hBoard, DS_GH_VECTOR_DATA_X, TimBaseAddr, DS_GH_SIZE16_CUT, buf, BufSize)
else
Status = GetMem(hBoard, DS_GH_V
end
else % board has linear or Harvard mem
Status = GetMem(hBoard, DS_GH_LINEAR
end
if (Status == NULL)
errstr = ['problem with GetMem; err
disp(errstr);
end
% draw buffer data
plot(buf);
x 10
2
1
0
-1
-2
0
50
100
150
200

DirectDSP software offers direct access to DSP boards from MATLAB

DirectDSP uses an ISA, PCI, or parallel port connection to the DSP host port(s) to provide a high-speed link direct to the DSP, allowing bulk transfers of data between MATLAB and the DSP board. Data – as well as variables and objects defined in DSP assembly or C code – can be read and updated dynamically, while the DSP continues to run. DirectDSP also contains:

- direct access to DSP onchip, board, and analog I/O related functions
- board configuration and control
- COFF file download
- "buffer-ready" callback messages
- DSP property set/get
- multiprocessor support
- debugging functions

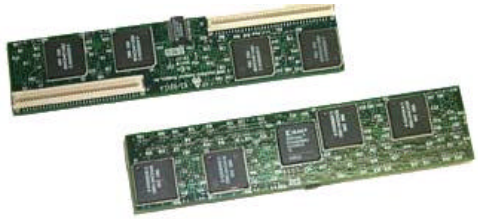
Since DirectDSP does not depend on JTAG, it can be used in a complementary fashion with software such as Texas Instruments' Code Composer Studio™.

DirectDSP is software compatible with Visual C/C++, Visual Basic, and LabVIEW. The software CD contains demo programs plus several example source code and project files.

Texas Instruments C5421 and C5441 Design

The Texas Instruments C5421 processor will soon be the highest volume DSP used in telecom and Internet infrastructure equipment requiring massive voice-channel and VoIP processing. This device contains two fully independent 100 MIPS cores that can each see 192k x 16 of on-chip memory, with 128k x 16 of this memory being shared between cores. The entire device footprint is 11 mm x 11 mm.

The SigC5421-CONAN module (shown below) contains eight of these devices, plus a Xilinx CPLD with the "Multicore API" logic that provides broadcast mode and other multi-core features.



SigC5421-CONAN: 1600 MIPS in 0.75" x 4" area

Signalogic has recently been engaged in C5421-based projects for telecom and Internet infrastructure clients. In this process, our engineers have become expert at this device, including both software and hardware design.

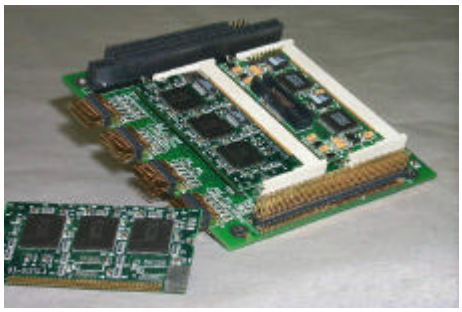
C5441: Quad Core

Next up from Texas Instruments is the C5441which not only doubles the core density, but also runs at 133 MHz for an overall 5x increase in MIPS density in the same 11 mm x 11 mm footprint. Signalogic engineers are already engaged in C5441 development.

For more information:
www.signalogic.com/c5421_page.htm

Telecom and Internet in a Small Package: SigC54xx-PC/104

The SigC54xx-PC/104 board uses a module approach to provide up to 4800 MIPS in a single PC/104 form-factor footprint. The board accepts modules with Texas Instruments C54xx DSP processors and also modules with 16-bit audio and speech analog I/O. It is suitable for embedded telecom and Internet infrastructure applications where space is at a premium.



SigC54xx-PC/104 board uses module approach to provide high-density telecom and audio I/O in small form-factor

The board also contains host PC interface, boot/FLASH EEPROM for stand-alone operation, RS-422 drivers and digital I/O, and expansion connectors.

When used in development the SigC54xx-PC/104 board is fully supported by DSPower®, DirectDSP™, and Hypersignal® software.

For more information:
www.signalogic.com/sigc54pr.htm

MELP Vocoder System

Signalogic has developed a bit-exact, real-time MELP (Mixed Excitation Linear Predictive) implementation for Texas Instruments C54xx DSP processors. This implementation is based on the new government vocoder communication standard for 2.4 kbps (300 bytes per sec) compressed speech, which supersedes the previous "LPC10" standard.

The extremely low bit rate of 2400 bps (300 bytes per sec) makes the MELP speech compression algorithm suitable for a wide range of telecom applications, including next-generation VoIP (Voice-over-Internet Protocol) speech CODECs.

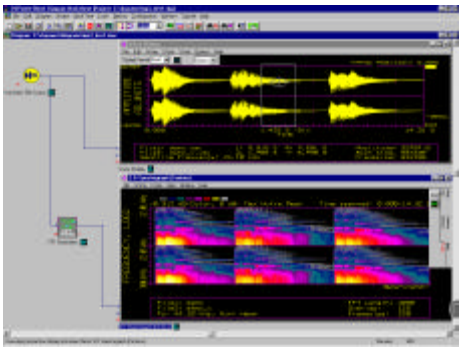
The SigC54xx MELP System is fully supported by the SigC54xx Development System and DirectDSP software, which provides direct access, analysis, monitoring, and real-time debug capabilities from C/C++ (MSVC and Borland), MATLAB, Visual Basic, and LabVIEW host environments.

For more information:
www.signalogic.com/melp.htm

Real-Time Algorithms

In addition to off-the-shelf DSP software/hardware development tools and OEM products, Signalogic is engaged in ongoing development of real-time DSP algorithms for use in telecom, control system, and audio / acoustic applications.

Algorithm areas such as MP3, Windows Media, new speech CODECs for VoIP, several acoustic / audio algorithm types, and speech recognition are being developed for real-time DSP devices.



Time domain and frequency domain waveform representations of before-and-after MP3-processed audio

The MP3 development project is a good example. Unlike a typical PC / Windows 2-channel real-time implementation, common in “streaming audio players” like Real Networks, the design and development emphasis at Signalogic is towards telecom and internet infrastructure applications. Examples include optimized performance for specific DSP devices, multichannel operation, and combined data/voice/audio delivery over different network protocols such as UDP/RTP and ATM.

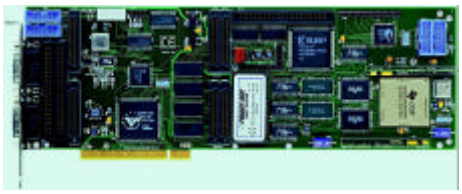
For more information:
www.signalogic.com/mp3.htm

C6xxx Support: M62, M67, and DSK C6211

Signalogic DSP systems engineers are currently building support for the following C6xxx boards:

- Innovative Integration M62
- Innovative Integration M67
- Texas Instruments DSK C6211 board

The M62 and M67 boards are especially promising because they accept the same line of OMNIBUS modules that Signalogic already supports on the M44 board. This means these boards will have wide coverage in terms of analog I/O options, including 4-to-16 channel 100 kHz 16-bit SAR input/output, 4-to-16 channel 96 kHz 24-bit sigma-delta input/output, 20 and 40 MHz 4-channel 12-bit input, and 40 MHz 4-channel 12-bit output.



The M67 board is a PCI card with 166 MHz 32-bit floating-point C6701 processor and two (2) OMNIBUS module sites

The DSK C6211 is expected to be Texas Instruments' workhorse board for research and university customers, and includes Code Composer Studio software support.

All of the C6xxx boards listed above will be fully supported by DSPower®, DirectDSP™, and Hypersignal® software.

For more information:
www.signalogic.com/sigc54pr.htm

Focus on Digital Voice

Digital voice processing is the technology at the core of the re-design of our telecommunications infrastructure that is taking place now -- the entire system as we know it is changing. Telecom companies one after another are competing to introduce digital voice processing into existing and new telecom systems. Precipitating this competition has been the Internet. With its promise of nearly free long distance calling, streaming audio, customized news and entertainment delivery, home ordering, and other powerful and convenient work productivity and lifestyle improvements, the Internet has unleashed free-market forces which make fast-paced telecom infrastructure re-design necessary.

Digital Voice vs. DSP

Instead of the term "DSP" which applies to existing products, Signalogic is looking ahead to becoming a "digital voice technology" provider, to encompass all types of voice-over-X applications – whether general-purpose DSP devices, specialized DSP devices, dedicated voice processing chip-sets, or some other method is used. Of course this includes digital audio as well, although the current networds refer to voice (VoIP, VoATM, etc.).

Nature of Signal Processing Based Solutions

To compete effectively in the digital voice processing market, the nature of the product – which starts with fundamental and basic signal processing concepts -- requires:

- breadth of knowledge and design expertise, not only about the hardware platform but also the software that runs on it
- full development system support, including both host-side and embedded-processor side software support
- hardware design skills, from module-level to main board-level
- implementation-stage technical support

The nature of signal processing solutions requires an extremely broad level of customer support and services, including design expertise and "messy" areas such as software development. The models for this type of coverage are Intel and Texas Instruments: at a basic level they provide devices and components, but in addition they provide a range of software support and development tools in an effort to help their customers use – and continue to use -- their components.

For more information on new digital voice projects underway at Signalogic:
www.signalogic.com/new_projects.htm

DSP Source Code Interfaces

In addition to specific algorithms, Signalogic also provides general Source Code Interface (SCI) software for several DSPs. Each SCI is a real-time code base and framework for its DSP family. SCI features include:

- Insertion points for application-specific real-time C code
- Analog I/O support for each board in the DSP family which has this option
- DSP/data acquisition boards are supported.
- Multiprocessor support
- Host interface support provides high-speed bulk transfers of data between the DSP and host environment (Visual C/C++, Visual Basic, MATLAB, or LabVIEW). Data – as well as variables and objects defined in DSP assembly or C code – can be read and updated dynamically, while the DSP continues to run.
- Default real-time operating modes and source code, including continuous analog and digital input and output, frame-based continuous input, and continuous simultaneous input/output
- Integration support for specific telecom, control system, and acoustic/audio algorithms
- Basic math and DSP routines

One important purpose of the SCI is to allow designers to add application-specific real-time DSP code to the off-the-shelf DSP/data acquisition hardware. The SCI format makes it straightforward to insert application-specific C/asm code into the real-time data stream. Another important purpose is to provide integration support for high-performance telecom, control system, and acoustic/audio algorithms. By providing a framework, including analog and digital I/O support and host interface, integration and debug for algorithms is made consistent, well-documented, and simplified.

For more information:
www.signalogic.com/dspcode.htm
www.signalogic.com/ccode.htm

How to Reach Us

Tech Sales	1-800-DSPower or dspinfo@signalogic.com
Telphone	214-343-0069
Tech Support	dsphelp@signalogic.com
Website	www.signalogic.com
FTP	ftp.signalogic.com
Address	Signalogic, Inc 9617 Wendell Road Dallas, TX 75243

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9617 Wendell Road
Dallas, TX 75243